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RADIUM

EDITED BY
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AND
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VOL. IX August, 1917 No. 5

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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES.

Edited and Published by Charles H. Viol, Ph. D., and William H. Cameron, M. D with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

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VOL. IX AUGUST, 1917 No. 5

A REPORT OF THE WORK CARRIED OUT AT THE RADIUM INSTITUTE, LONDON*

From January 1st, 1915, to December 31st, 1916.

By A. E. Hayward Pinch, F. R. C. S., Medical Superintendent

This report deals with the cases which have presented themselves at the Radium Institute from January 1st, 1915, to December 31st, 1916, inclusive—a period of two years. It was found impossible to issue a report at the end of 1915, many members of the staff being away on active service, and the time of those remaining being completely taken up by the clinical work of the Institute.

The character of this report is in many respects similar to that of those issued in 1913, 1914 and 1915, but the description of apparatus and technique has been omitted this year, as information on these points can be obtained by reference to the former reports. [1]

The policy of declining to treat operable cases of malignant disease —rodent ulcer alone excepted—has been rigidly adhered to, save in those instances where the patient has positively refused to submit to operation.

The cases treated were in no instances selected, and the only ones refused were those in which the patients were practically moribund, or where the disease was of a kind for which radium therapy was manifestly unsuitable.

* An abridged form of the Report, omitting many of the illustrative case histories. Copies of the full text of this Report can be obtained by medical men by application to the Secretary, at 16, Riding House Street, London, W. Eng. Ed.

1. An abridged form of the Report for 1914 appeared in the British Med. Jour. of Feb. 27, 1915, and was reprinted in RADIUM, May, 1915, in which the description of apparatus and technique was included. Ed.

The term "apparent cure," used in relation to cases of malignant disease, must be interpreted as representing a condition in which all trace of the original lesion or lesions has disappeared, in which there is no sign of any recurrence, and in which the patient is, so far as can be determined by a thorough and careful examination, free from any indication or symptom of the disease.

Cases have been classed under the heading "improved" only when the result of treatment has been to produce a definite and marked degree of benefit, either in the direction of retardation of the progress of the disease, diminution in the size of a growth, healing of ulceration and arrest of haemorrhage and discharge, or of relief to such subjective symptoms as itching, tenderness, pain, dyspnoea and dysphagia.

With reference to the figures appearing in the columns headed "Results not yet noted," and "Abandoned Treatment," it must be explained that in many instances it has proved impossible to obtain information concerning the patients treated, owing either to the absence of their medical men on military duties; or alteration in the patients' circumstances having caused them to depart to some other neighborhood, and all trace of their movements being lost.

The strength of all the apparatus used in the treatment of cases is expressed in terms of hydrated radium bromide, a salt the radium element content of which is 53.6 *per cent.* [1]

TABLE I.

Summary of Cases.

Examined, but not treated	87
Recently treated, and results not yet noted	123
Received prophylactic irradiation only	33
Apparently cured	172
Cured	52
Improved	498
Not improved	215
Abandoned treatment	144
Dead	76
	1,400

CARCINOMATA. SQUAMOUS CELLED (EPITHELIOMATA). The results obtained in the treatment of small epitheliomata affecting glabrous surfaces are encouraging, and when operative measures have been declined, heavy dosage with powerful unscreened applicators affords a reasonable chance of success.

Epitheliomata of the buccal, laryngeal and pharyngeal mucous membranes still prove very troublesome, and though temporary improvement frequently follows on radium treatment, the final result is usually disappointing.

In some rare instances isolated nodules in the tongue respond well to the burying within their substance of a tiny powerful emanation tube of 50 mgr. or more initial activity, screened with 1 mm. of silver or 0. 3 mm. of platinum for a period of eighteen to twenty-four hours. A brisk reaction occurs followed by fibrous changes in the nodule, and arrest of the disease. Small circumscribed growths ocurring in the soft

1. Very important to bear in mind since radium dosage in the United States is always expressed in radium element. Italics are ours. Ed.

palate do comparatively well under this method of treatment, and may be regarded as the most suitable of all epitheliomatous lesions in the mouth and fauces, for radium therapy.

Primary epitheliomata affecting the vaginal mucosa usually react satisfactorily to prolonged exposures with powerful applicators heavily screened, and if of recent origin and without much surrounding induration are often completely removed.

CARCINOMA OF THE UTERUS. The symptomatic improvement which almost invariably follows upon the radium treatment of inoperable cases of this disease is most striking, and far exceeds that of any other therapeutic measures. Arrest of haemorrhage, lessening of discharge, healing of ulceration, reduction of surrounding infiltration, diminution of the rate of growth, and amelioration of pain are constantly observed, and in some instances cases previously declared to be inoperable become operable. When the disease is confined to the cervix, and the growth is of the fungating type, a preliminary curetting of the ulcerated mass is advisable.

The best results are obtained by the introduction of a 50-mgr. or 100-mgr. tube, screened with 2 mm. of lead and 3 mm. of rubber, into the cervical canal, or if this be impracticable, into the posterior fornix, a powerful flat applicator, containing 80 mgr. to 100 mgr., screened in similar fashion, being placed on the abdominal wall over the fundus uteri. The exposure should be from thirty to sixty hours' duration, spaced over from five to ten days.

The treatment should be repeated at intervals of six weeks or two months. In very susceptible patients a slight degree of vaginitis is sometimes seen, and on this account the patient should be instructed to use a vaginal douche night and morning, to prevent the possible formation of adhesions.

CARCINOMA OF THE RECTUM. Patients suffering from this disease vary very greatly in their response to radium treatment, and the results are by no means constant or uniform. Speaking in general terms, the cases which do best are those occurring in patients over fifty years of age, and in which the growth is annular in type, vascular in character, and situate in the upper half of the rectum. The plaque-like growth, with much surrounding infiltration, is but rarely improved, and owing to the difficulty of shielding the adjacent healthy mucuous membrane from the action of the radium rays, proctitis generally occurs, and is very troublesome.

Many patients apply for radium treatment in the hope of postponing or averting the operation of colostomy. If the growth be annular, vascular and exuberant, with a tortuous and much constricted lumen, radium treatment will often relieve the threatened obstruction.

The introduction of a powerful radium tube actually within the lumen of the growth serves first to dilate the stricture mechanically, and the reaction when it occurs produces some degree of avascularization, and shrinking of the more prominent portions of the tumour, thus widening the canal. When the growth is of a spongy character these effects may be observed to follow after each of three or four or more courses of treatment given at intervals of two or three or four months.

Sooner or later, however, fibroid contraction of the lumen will occur, necessitating the performance of colostomy, or regular dilatation of the stricture, either digitally or with bougies.

TABLE II
Classification of Cases

DISEASE	Examined, but not treated	Result not yet noted	Received prophylactic treatment only	Apparently cured	Cured	Improved	Not improved	Abandoned treatment	Dead	Total
Carcinoma, Squamous-celled:										
Glabrous skin	1	4	1	5	—	4	6	6	2	29
Buccal, oral, lingual, and pharyngeal mucous membranes	14	4	6	4	—	25	13	30	16	112
Oesophagus	3	4	—	—	—	1	1	3	3	15
Larynx	1	2	—	—	—	—	5	4	4	16
Vagina	—	1	—	4	—	1	1	—	—	7
Vulva	—	1	—	—	—	—	1	3	1	6
Uterus	6	6	—	1	—	34	13	23	10	93
Penis	1	—	1	—	—	—	—	—	—	2
Bladder	1	—	—	—	—	1	1	—	—	3
Uretha	—	—	—	1	—	—	—	—	—	1
Carcinoma, Spheroidal-celled:										
Breast	8	17	12	6	—	67	24	24	14	172
Liver and gall bladder	—	—	—	—	—	—	1	1	2	4
Thyroid	—	—	—	—	—	1	—	—	1	2
Pancreas	—	—	—	—	—	1	—	—	—	1
Paget's disease	2	—	—	—	—	1	—	—	—	3
Carcinoma, Columnar-celled:										
Large intestine	4	1	1	—	—	3	2	—	—	11
Rectum	4	6	—	—	—	33	10	14	8	75
Stomach	—	2	—	—	—	—	—	—	—	2
Ovary	—	1	—	—	—	—	4	—	—	5
Prostate	—	2	—	—	—	2	1	1	—	6
Kidney and suprarenal gland	—	1	—	—	—	1	—	—	—	2
Parotid	—	—	—	—	—	1	—	—	—	1
Rodent ulcer	—	10	1	122	—	37	8	6	2	186
Sarcomata:										
Spindle-celled	2	—	4	1	—	10	13	4	1	35
Round-celled	3	3	1	1	—	5	6	6	1	26
Melanotic	—	—	—	1	—	—	1	—	—	2
Myelosarcoma	—	—	—	—	—	—	—	1	1	2
Lymphosarcoma	—	—	—	2	—	2	—	7	2	13
Osteosarcoma	—	—	—	—	—	—	1	—	—	1
Endothelioma	—	—	—	—	—	2	—	3	1	6
Lymphadenoma	1	2	—	2	—	16	1	1	—	23
Malignant glands	2	2	1	1	—	5	8	2	3	24
Parotid tumour	—	2	3	—	—	4	—	—	—	9
Abdominal tumour	1	1	—	—	—	—	—	—	1	3
Mediastinal tumour	—	2	—	—	—	3	—	1	2	8
Villous tumour of bladder	—	—	—	—	—	2	—	—	—	2
Glioma	—	—	1	—	—	—	2	—	—	3
Enchondroma	1	—	—	—	—	—	—	—	—	1
Cystic disease ovary	—	—	—	—	—	—	3	—	—	3
Adenoma (thyroid)	3	—	—	—	—	5	1	—	—	9
Fibromata	—	—	—	—	—	1	—	—	—	1

DISEASE	Examined, but not treated.	Result not yet noted.	Received Prophylactic treatment only.	Apparently cured.	Cured.	Improved.	Not improved.	Abandoned treatment.	Dead.	Total.
Fibroid disease of uterus	1	—	—	1	—	3	2	—	—	7
Leucoplakia	—	—	—	1	—	2	—	—	—	3
Naevi:										
Capillary	—	4	—	—	8	17	3	—	—	32
Cavernous	1	1	—	—	8	16	5	—	—	31
Moles, warts and papillomata	—	—	—	—	24	12	1	1	—	44
Tuberculosis:										
Glands	—	1	—	—	—	1	—	—	—	2
Skin	1	1	—	6	—	18	2	—	—	28
Mucous membrane	—	—	—	2	—	3	—	1	—	6
Spring catarrh	—	—	—	1	—	1	—	—	—	2
Trachoma	—	—	—	—	—	1	—	—	—	1
Chronic inflammations	3	3	—	—	—	4	3	—	—	13
Chronic ulcerations	4	2	—	—	—	1	1	—	—	8
Chronic endometritis	1	1	—	2	—	1	—	1	—	6
Skin diseases:										
Keloid and vicious cicatrices	2	6	—	—	9	24	1	—	—	42
Lupus erythematosus	—	1	—	1	—	6	—	—	—	8
Psoriasis	1	1	—	—	—	2	—	—	—	4
Pruritus	—	1	—	3	—	8	—	—	—	12
Chronic eczema	—	—	—	—	3	2	—	—	—	5
Lichenification of skin	—	1	—	—	—	2	—	—	—	3
Roentgen-ray dermatitis	—	—	—	—	—	2	—	—	—	2
Lichen planus	—	—	—	—	—	1	—	—	—	1
Leucodermia	—	—	—	—	—	—	1	—	—	1
Sclerodermia	—	—	—	—	—	1	1	—	—	2
Sycosis	—	—	—	2	—	1	—	—	—	3
Xerodermia pigmentosum	—	—	—	—	—	2	—	—	—	2
Xanthelasma	—	—	—	—	—	1	—	—	—	1
Fordyce's disease	—	—	—	1	—	1	—	—	—	2
Rhinophyma	—	—	—	—	—	1	—	—	—	1
Urticaria	—	—	—	—	—	—	1	—	—	1
General diseases:										
Disseminated sclerosis	—	—	—	—	—	2	2	—	—	4
Exophthalmic goitre	—	—	—	—	—	2	—	—	—	2
Neurasthenia	2	—	—	—	—	—	2	—	—	4
Neuritis	1	3	—	—	—	2	4	—	—	10
Neuralgia	—	1	—	—	—	1	—	—	—	2
Gout	—	2	—	—	—	2	3	1	—	8
Rheumatism	2	2	—	—	—	7	2	—	—	13
Arthritis deformans	5	14	—	—	—	77	50	—	1	147
Angio-neurotic oedema	—	—	—	—	—	—	1	—	—	1
Diabetes	—	—	—	—	—	1	—	—	—	1
Raynauds disease	—	—	—	—	—	—	1	—	—	2
Dupuytren's contraction	—	—	—	1	—	—	1	—	—	1
Splenic anaemia	—	—	—	—	—	1	—	—	—	1
Tinnitus	—	—	—	—	—	—	1	—	—	1
Abdominal adhesions	—	—	—	—	—	1	—	—	—	1
Various	4	—	—	—	—	—	—	—	—	4
Totals	87	123	33	172	52	498	215	144	76	1400

When the growth is of considerable extent and ulceration is present, the performance of colostomy before radium treatment is commenced is strongly to be advocated, as the constant passage of faeces over an ulcerated surface that is reacting to radium is productive of great pain. When the tumour is situate at the recto-sigmoid junction, the presence of a colostomy aperture also enables the upper portion of the growth to be treated with a tube passed down the sigmoid through the lower colostomy opening.

The routine method of treatment consists of a thirty-hour exposure —five day of six hours each—with a tube containing 100 mgr., screened with 2 mm. of lead and 3 mm. of rubber, and applied within the lumen of the growth, the series of exposures being repeated at the end of six or eight weeks.

When the disease affects the recto-sigmoid junction a flat applicator, containing 80 to 100 mgr. screened in similar fashion is applied over the inner part of the left iliac fossa.

Some amount of proctitis is generally noted about a week or ten days after the termination of the treatment, and though it usually proves but slight and transient, in susceptible subjects—more especially in men—it is sometimes exceedingly severe, and occasions the patient much pain and discomfort, which may persist for four or six weeks.

CARCINOMA OF THE BREAST. Radium should never be used as a substitute for operative interference in the treatment of early cases of mammary cancer, and should be resorted to only when the disease is inoperable, or the patient has refused to submit to operation.

In slow growing cases of the atrophic type, it is often of very considerable use in checking the progress of the disease, arresting or even healing an existing ulceration, diminishing induration and lymphatic engorgement, and ameliorating the pain. It will quite frequently cause the disappearance of small subcutaneous nodules, and reduce the size of infected glands.

To produce these results prolonged exposures with powerful applicators screened with 2 mm. of lead and containing 250, 300 or more milligrammes are necessary, and the exposures will probably have to be repeated at intervals of two or three months. Isolated recurrent nodules, inoperable by reason of their attachment to bone or cartilage, are best treated by the insertion of a small powerful emanation tube screened with 1 mm. of silver or 0.3 mm. of platinum into their substance for from eighteen to twenty-four hours. This procedure is quite frequently followed by complete disappearance of the nodules.

In cases where pleurisy or ascites resulting from carcinomatous infection of the pleura or peritoneum exists, striking results often follow upon the application of powerful screened apparatus over the affected area. Paracentesis should be performed shortly before the exposures are given, and further accumulations of fluid are then generally either much decreased or effectually prevented.

Rapidly growing carcinomata of the medullary type are but little affected by radium, and not much benefit other than possible relief from pain is likely to follow the employment of even very large dosage.

Case No. 1960, F., aged 68. This patient had her right breast removed and axilla cleared for malignant disease in April, 1913.

She kept in fairly good health until October, 1915, when she began to suffer from pain in the neighbourhood of the sternum, and shortly

afterwards a swelling appeared and grew rapidly. She was examined at the Institute on 17th December, 1915. There was then a hard, prominent, firmly-fixed nodule, almost circular in shape, and 6 cm. in diameter, situate over the centre of the manubrium sterni. It was not tender, but the site of lancinating pains. No other sign of recurrence was appreciable.

The patient received 24 hours' treatment with flat applicators containing 200 mgr. applied over and around the nodule. In addition to this an emanation tube of 70-mgr. activity, screened with 1 mm. of silver, was buried within the nodule for twenty hours.

She reported herself for examination on February 9th, 1916. No trace of the nodule remained. She no longer had any pain, and was in excellent health.

She has since kept perfectly well.

RODENT ULCER. This is of all forms of malignant disease the one which is most amenable to the action of radium. Lesions which have not been subjected to any previous treatment with X-rays, CO_2 snow, ionization, etc., which do not affect mucous membrane, bone or cartilage, and do not exceed 3 cm. in diameter, can almost invariably be cured by one treatment. A full-strength applicator is used unscreened, and an exposure of between one and a half and three hours' duration given, the length of exposure being determined by the amount of induration and infiltration present.

The reaction which follows upon this procedure is usually severe, but the resultant scar is smooth, supple and inconspicuous, and the tendency to recurrence extremely slight.

When the extent, position, or character of the ulcer preclude the possibility of strong unscreened exposures, the best results will probably be attained by prolonged exposures with heavily screened apparatus.

The much thickened and indurated edges so often met with in cases of very long standing respond very satisfactorily to the action of powerful emanation tubes screened with 0.3 mm. of platinum and buried in the thickened border for from twelve to eighteen hours.

SARCOMATA. These growths usually do well, if treated before dissemination into any of the internal viscera has taken place. It is very important, however, that the treatment should be vigorous, and whenever possible it should be carried out both by the burying of emanation tubes within the substance of the growth, and by the external application of powerful screened apparatus, a total exposure of about thirty hours' duration being given and repeated after five or six weeks.

The best results are seen in lympho-sarcomata, and the response of this class of tumour to radium therapy is very remarkable, the growths commencing to shrink within a few days of the termination of the treatment, and rapidly disappearing. Some systemic disturbance is generally noticed, the temperature rising to 101°—102°, with great languor and occasional nausea or even vomiting. These symptoms, however, prove quite transient, and rarely persist for more than four or five days.

Sarcomata of the tonsil and post-nasal space give almost equally good results, as do also periosteal sarcomata of the long bones, if treated at an early stage.

LYMPHADENOMA. Cases of this disease of not very long standing and in which the secondary anaemia is not severe, and the spleen and mesenteric glands are unaffected, generally derive great benefit from

radium treatment, the enlarged glands disappearing, and the disease being arrested.

The patients must, however, be kept under close supervision and the treatment repeated if any signs of recrudescence appears.

Prolonged exposures with powerful and heavily screened apparatus are employed and the series repeated at intervals of three, six or twelve months as may be necessary.

LYMPHADENOMA. Case No. 2175, F., aged 60. The patient was first seen at the Institute on July 24th, 1916. The disease was then said to have existed for six months.

When examined a prominent mass was conspicuous on the right side of the neck extending from mastoid process to clavicle. It was the size of a small cocoanut, and greatly disfigured the patient's appearance. Palpation showed the tumour to consist of a number of enlarged, elastic, discrete, freely movable glands. A solitary enlarged gland was also present in the left posterior cervical triangle at the level of the cricoid.

Patient had no pain, and was in fairly good general health, though she complained of loss of strength and energy. She was treated from July 24th to 28th inclusive, six hours each day, with powerful applicators containing 300 mgr. placed over and around the affected glands. Improvement was noted within a fortnight of the treatment, and the patient made rapid and uninterrupted progress.

By the commencement of September the mass on the right side of the neck was scarcely visible, and the solitary gland on the left side had disappeared.

At the end of the year no trace of the trouble existed. Patient was in excellent health, and feeling perfectly well.

MEDIASTINAL TUMOURS. These growths appear to be particularly susceptible to the action of radium, and in almost every case that has come under observation considerable benefit has resulted. The rate of growth has been checked or arrested, and often an actual decrease in the size of the tumour has been clearly established by X-ray screening.

If the condition be accompanied by an accumulation of fluid in the pleura, and paracentesis be performed before the treatment is commenced, radium seems to exert a very remarkable action in lessening the tendency to the production of further effusion.

In these cases the use of a very large quantity of radium (400 to 500 mgr.) is indicated. The applicators should be screened with 2 mm. of lead, and disposed in such fashion over the chest wall as to procure the maximum "cross-fire" irradiation.

Treatment must be very persistent, a total exposure of not less than thirty hours' duration should be given, and repeated at intervals of six weeks or two months.

This heavy dosage is almost invariably followed in two or three days' time by a feeling of great fatigue and exhaustion with a slight rise of temperature; but this disturbance is quite transient, and disappears completely in about a week.

FIBROID DISEASE OF THE UTERUS. Satisfactory results are often observed to follow upon the radium treatment of this disease, more especially when menorrhagia and metrorrhagia are the most prominent and troublesome symptoms.

When all ordinary methods of treatment have failed, and the patient declines to submit to operation, radium therapy is well worthy of trial, as it will almost certainly lessen or abolish the excessive loss of blood.

and will, in addition, sometimes produce considerable diminution in the size of the uterus.

Treatment is best carried out by the introduction of a tube containing 100 mgr. screened with 2 mm. of lead into the body of the uterus—or if this be impracticable, into the posterior fornix—supplemented by a plate of from 80 to 100 mgr. screened in similar fashion, and applied on the abdominal wall above the fundus uteri.

The total exposure should be not less than thirty hours' duration, and the series should be repeated after two or three months.

The period immediately succeeding the radium application is often more profuse than usual; then the metrorrhagia is checked, and this is followed by a progressive decrease of the menorrhagia, until the flow becomes normal; or, as is sometimes seen in very susceptible subjects, amenorrhoea occurs, and persists for four, six or more months.

Papilloma of Bladder. Encouraging results have been obtained in the treatment of the few cases of this disease which have come under notice. The haematuria has been lessened or completely checked, and shrinking of the papillomatous growths has taken place. Pain and frequency of micturition have been much relieved, and the patient's general health greatly improved.

Papilloma of Bladder. Case No. 5975, F., aged 32. This patient had supra-pubic cystotomy performed in October, 1914, when bunches of fine papillomata covered with gritty deposit surrounding the orifice of each ureter were excised, the bases being treated with the thermo-cautery. Within about a month haematuria recurred, and there was increasing pain and straining at micturition.

When seen in February, 1915, the general surface of the mucous membrane appeared healthy. Two small isolated papillomata existed on the posterior wall near the apex, and large masses, surmounted by a white, hard deposit, surrounded the posterior, right, and left lateral aspects of internal meatus.

A plate, containing 80 mgr. screened with 1mm. of lead, was applied immediately above the symphysis pubis for eighteen hours, distributed over four days. A tube containing 50 mgr. in a screen of 1mm. of silver was passed into the bladder, and left for two or three hours each day. Two months later the patient's symptoms were unchanged, but cystoscopy revealed a layer of necrosis over all the papillomata. The trigone was red and oedematous. A second treatment was carried out, an external plate of 70 mgr. screened with 1.5 mm. of lead being employed for twenty-four hours, distributed over five consecutive days, and a tube of 50 mgr. in 1 mm. of silver being inserted for eight hours in all.

Three months later the haematuria had ceased, and the papillomata had all disappeared. There was, however, a considerable superficial ulcer with a chamois-leather base surrounded by a red margin in the trigone. This remained unchanged for a considerable time until there began a slow process of healing from the margins, and cicatrization gradually took place.

Lupus Vulgaris. This condition usually responds better to treatment with Finsen light than with radium; but when the former method of treatment fails to effect a cure, radium may be used with a fair prospect of success.

Treatment must be vigorous, however, and an exposure of one to one and half hours' duration with an unscreened applicator given. This

produces a very definite reaction with formation of a crust, which when it separates leaves a smooth and supple scar.

Lupus Vulgaris. Case No. 1714, F., aged 39. This patient had suffered from lupus of the right side of the neck for twenty years. During the last ten years she had received numerous treatments with Finsen light, which had kept the disease in check, but never completely cured it.

When examined at the Institute on April 30th, 1915, there was a broad band of firm scar tissue on the right side of the neck extending from the lobule of the ear to the level of the hyoid bone. At its centre there was a reddened superficially ulcerated patch 2 x 1 cm. in extent. Diascopy revealed numerous definite "apple-jelly" nodules all over this area. Patient was treated with a full strength apparatus containing 60 mgr. applied without screen for one hour. There was a sharp reaction, and when she again was seen on July 2nd, the ulcerated area had been replaced by a smooth, supple scar. No apple-jelly" nodules were visible on diascopy.

The patient has since kept perfectly well.

Naevi. *Flat Superficial Naevi, Capillary Naevi, "Port Wine Stain."* These lesions, when small, superficial, and easily blanched by slight pressure, may be treated by one exposure with an unscreened apparatus of from thirty to sixty minutes' duration. If extensive, and tending to infiltrate the deeper tissues, treatment will be long and tedious, and much care and patience will be necessary to produce a satisfactory result. It is best to use applicators screened with 1/100 mm. of aluminium, and to give at first exposures of from fifteen to twenty minutes' duration, repeating the treatment every six weeks, and gradually increasing the time of exposure till a definite lightening of the colour is obtained. So soon as the lesion has assumed a salmon-pink tint the screening should be altered to 1/10 or 2/10 mm. of lead, and the length of exposure increased to one and a half or two hours.

These exposures must be given at longer intervals of three or four months. Careful watch must be kept for the occurrence of telangiectases, and should any appear, they must be promptly treated with a fine-pointed electric cautery.

Case No. 6057, F., aged 6. This child had a small bright red raised capillary naevus external to the left eye. A small applicator containing 10 mgr. screened with 1/100 mm. of aluminium was applied for twenty-five minutes. Six weeks later the margins had cleared up, but a central vessel was visible. A "matchhead" apparatus was aplied to this for thirty minutes, and in two months' time only a tiny red dot remained.

Cavernous Naevi. These should be treated at the earliest possible moment, as their response to radium irradiation within the first six months of infancy is much more rapid and complete than in later life.

Applicators screened with 1/10 mm. of lead are employed and so disposed over the tumour as to procure a maximum "cross-fire" irradiation.

Exposures of from thirty to sixty minutes' duration are given on each of three successive days, and the series repeated at intervals of six weeks. Little or no surface irritation follows this method of treatment, and the naevus shrinks gradually and steadily, till level with the surrounding skin.

Case No. 1857, F., aged 3 months. This infant was first seen on September 17th, 1915. There was then a hemispherical cavernous naevus at the apex of the left axilla, 1.5 cm. in diameter. It was dark purple in colour, and boggy to the touch. It could be partially emptied by firm pressure, but quickly refilled. No treatment had been adopted, and the lesion was steadily increasing in size.

The child was treated with a circular applicator, 2 cms. in diameter, containing 16.5 mgr. of radium, screened with 1/10 mm. of lead, and applied for a period of two hours.

This exposure was repeated at intervals of eight weeks, and the naevus steadily shrank.

When last examined on May 18th, 1916, it was completely replaced by a flat firm fibrous plaque, the colour of which was but very little darker than that of the surrounding skin.

Warts and Papillomata. Warts and Papillomata may be satisfactorily removed by exposures of from thirty minutes' to two hours' duration with unscreened applicators.

The time of exposure must be proportioned to the size and thickness of the lesion. If this be accurately adjusted the surface reaction is slight, and little or no scarring results.

Keloid. In young subjects and when the growth is of recent origin, the radium treatment of keloidal scars is most successful. Powerful applicators screened with 1 mm. of silver should be employed, and exposures of from twelve to twenty-four hours' duration—six hours on each of two, three, or four successive days—should be given. The series should be repeated at intervals of six weeks.

By this method a gradual absorption of the keloidal tissues without any surface irritation is obtained. In tender and painful keloids the anaesthetic effect of radium is generally very pronounced, and appears quite early during the treatment.

Old and very dense keloids sometimes prove refractory to the routine method of treatment, and in such instances the screening should be altered to 1/10 mm. of lead, and exposures of three or four hours' duration given.

Lupus Erythematosus. This very intractable and puzzling condition, which so often defies all the usual methods of treatment, frequently responds most favourably to radium.

Applicators sufficiently large to reach well beyond the borders of the lesion should be employed, either unscreened or screened with 1/100 mm. of aluminium. Exposures of between thirty and sixty minutes' duration should be given, and repeated at intervals of four weeks.

Case No. 1606, F., aged 28. The patient was first seen on January 26th, 1915. The disease was then stated to be of rather more than a year's duration. Various constitutional and local treatments had been tried without effect.

When examined, there was an irregularly shaped lesion affecting the outer surface of right ala of nose, and spreading a little way on to the adjoining portions of cheek and upper lip. It was bright red in colour, covered with scanty papery scales, and had a slightly elevated hyperaemic border.

An exposure of thirty-five minutes' duration with a half-strength applicator containing 10 mgr. was given.

The patient was seen on March 9th; but little effect had been produced, and a second application was therefore made with the same ap-

paratus, the length of exposure being increased forty minutes. This second exposure was followed by a slight but quite definite reaction, and when patient was seen on April 28th the lesion had completely disappeared.

She reported herself at the end of November. No sign of any recurrence was appreciable.

Xerodermia Pigmentosum. Two cases of this malady have recently been under treatment at the Radium Institute, and in both instances removal of the ulcerated warty growths from the affected areas was satisfactorily accomplished.

In view of the extreme rarity of this affection, the cases are recorded in detail.

Xerodermia Pigmentosum. Case No. 2223, F., aged 12. This child was born in England, but was taken out to Ceylon when quite a young baby. The condition appeared when the infant was nine months old, and progressed steadily. The parents are first cousins.

The patient was first seen on September 13th, 1916. The disease affected the face, neck, arms and hands, and legs very slightly. The condition was quite typical, the skin of all exposed parts being dry, hard, and thickly covered with dark brown or blackish freckles.

Warty changes were occurring on the face and backs of the hands. Five hard, conical ulcerating areas situate on the upper lip and left cheek were treated.

Small applicators, each containing 10 mgr., were used and applied over the growths without screen for forty-five minutes.

The child was seen again on November 2nd. Three of the growths had disappeared, and the other two, treated on September 13th, were much smaller.

A second exposure was therefore given with the same applicators unscreened, the time being shortened to thirty minutes.

The result was most satisfactory, and in five weeks' time no trace of any of the growths remained.

The patient is being kept under observation, but no further treatment has yet been required.

Case No. 6510, M., aged 19. The disease first made its appearance when the patient was seven years old, the skin of the face becoming covered with dark freckles, dry and rough.

The first actual growth appeared on the lower lip when patient was fifteen, and was removed by excision. At subsequent dates small, hard, warty growths were removed from upper lip, lower eyelid of right eye, right cheek, bridge of nose and right side of nose. The condition had always been confined to the face, and had never affected the hands, arms or legs.

The patient was first seen at the Institute on October 11th, 1916. The skin of the face was dotted over with numerous blackish-brown freckles, many of which were hyperkeratosed and palpable. There were eight definite hard, conical, warty growths covered by blackish crusts, and situated as follows: Two on the left cheek, two on the nose, one on the helix of each ear, one on the upper lip (glabrous surface), and one on the lower lip (mucous surface). Of these growths five were treated on October 17th with small applicators, each containing 10 mgr., applied without screen for one hour or one hour and a half, the time

of exposure varying with the thickness of the growths. The three remaining ones were treated in similar fashion on December 5th.

The patient's doctor reported on January 2nd, 1917, that all the growths had disappeared, leaving smooth, white, healthy scars.

PRURITUS. Radium is often of the greatest use in the treatment of this condition, especially if it be of long standing and associated with leukoplakia or hyperkeratosis.

When no actual lesion exists, and the trouble is purely nervous in character, the results are not so satisfactory, and often but little benefit results from the application.

No definite rules can be laid down as to treatment, as the local conditions vary so greatly, but if much leukoplakia or hyperkeratosis be present, applicators screened with 1 mm. of silver and used for periods of six, eight or twelve hours appear to be most effective.

If, on the other hand, but little alteration in the character of the skin or mucous membrane be apparent, exposures of from ten to fifteen minutes' duration with applicators screened with 1/100 of aluminium are most likely to prove of benefit.

CHRONIC ECZEMA. Isolated patches of chronic eczema without much subjacent induration are frequently cured by radium when other methods of treatment have proved ineffective.

Short exposures of from three to fifteen minutes' duration should be given, and repeated at intervals of two to three weeks until the lesions have disappeared.

The tendency to recurrence in these cases is but slight.

Case No. 1589, F., age 22. The patient was first seen on January 8th, 1915, the condition had then existed for more than two years, and had resisted all forms of treatment.

When examined the upper two-thirds of both areolae were of a dusky brownish colour, contrasting strongly with the normal pink tint of the unaffected lower thirds. The skin was somewhat thickened, slightly indurated, and covered with loose branny scales. There was a very scanty serous exudate. No induration of the breast tissue was appreciable, and axillary glands were unaffected.

The patient complained of considerable and almost constant itching of the affected areas, and the disease was occasioning her much mental discomfort. She was treated on six occasions, January 8th, February 1st, April 22nd, June 8th, September 7th and November 1st, receiving at each sitting an exposure of 12 minutes' duration, with a square applicator 4 cm. in diameter, containing 80 mgr. unscreened.

Definite improvement was noted after the second application, the irritation subsiding, and the size of the affected areas being much lessened.

By the end of November all sign of the trouble had disappeared, and both breasts presented a perfectly healthy and normal appearance.

SYCOSIS. Case No. 1743, M., aged 54. This patient was seen on June 7th, 1915. On his left cheek was a red inflamed area of 3.5 x 3 cm., with slight thickening of the cuticle, and several pustules associated with the hair follicles. This had developed fourteen months previously, when the patient had been prospecting in Africa.

A plate containing 80 mgrs. unscreened, was applied over the whole area for an hour and a quarter. This gave rise to a sharp reaction in a fortnight, the whole surface being covered with a creamy layer of pus, and the hair exfoliating.

A month afterwards the surface was dry and clean, and the patient started off for Central Africa. He reported again some months later, and the disease had not recurred.

EXOPHTHALMIC GOITRE.—When the routine methods of treatment have failed to produce any benefit in this condition, radium therapy may be resorted to justifiably, as it will sometimes prove of very great value.

EXOPHTHALMIC GOITRE. Case No. 1645, F., aged 38. Journalist. This patient had had a "full neck" since childhood, but little attention was paid to it, and no treatment adopted. During the last year she had suffered from steadily increasing mental fatigue, was quite unable to concentrate her attention, and was excessively nervous. She was much troubled by palpitation of the heart, and became very breathless on exertion. Operative measures had been considered, but interdicted. The patient was first seen on March 12th, 1915. She was a tall woman of spare figure. There was a moderate degree of uniform enlargement of the isthmus, and both lobes of the thyroid gland, the greatest circumference of the neck being 36 cm. The gland moved freely on deglutition. No eye symptoms were present. There was a fine tremor of all the limbs, aggravated by voluntary movements. Pulse rate 146. Patient weak, restless and excitable.

She was treated from March 15th to 29th inclusive, receiving in all thirty hours' exposure with applicators containing 250 mgr. screened with 2 mm. of lead, and disposed over the gland in such fashion as to procure a "cross fire" irradiation. Patient was next seen on May 4th. She stated that the thyroid commenced to shrink rapidly ten days after her treatment terminated, and that at the end of three weeks it was very much smaller. This shrinking, however, had been accompanied by an exacerbation of all her symptoms, the tremors becoming more marked, the pulse rate quicker, and the exhaustion and restlessness more pronounced, so that for a period of three weeks she was much worse than she had ever been. During the last fortnight she had been improving, and now felt considerably better.

Examination showed the thyroid gland to be much smaller, the circumference of neck being now 33 cm. Pulse rate 122. Tremor lessened but still evident. Patient was very nervous and depressed. She was advised rest, quiet, and good feeding, but no further radium treatment; and asked to report again in five or six months. She came again on September 19th. She had made steady progress, the gland had not increased in size. Pulse rate 92. Tremor scarcely noticeable. She was much more restful, less nervous, and no longer depressed. She slept well and was putting on flesh.

She received a further eighteen hours' treatment with applicators containing 200 mgr. screened with 2 mm. on October 25th, 26th and 27th. No further improvement was recorded in her conditon, though, on the other hand, there was no relapse.

Early in 1916 she decided to submit to operation, and this was accordingly performed, the greater part of the gland being removed.

The surgeon who operated, expressed the opinion that the previous radium treatment had contributed greatly to the successful result.

EXOPHTHALMIC GOITRE. Case No. 1718, F., aged 31. This patient gave birth to her first child on August 9th, 1914. Three months later she sustained a severe nervous shock.

Tremor and tachycardia developed shortly afterwards, soon followed by swelling of the thyroid gland, but the eye symptoms did not appear until early in 1915.

She was first seen on May 7th, 1915. There was then a general swelling of the thyroid gland most evident on the right side, the circumference of the neck being 36 cm. Proptosis was definite and noticeable, but not great. Both Von Graefe's and Stellwag's signs could be elicited. There was a fine tremor of the hands on voluntary movement. The heart's impulse was forcible, and the pulse rate varied from 140 to 160 per minute. There was marked hyperidrosis. Patient was not irritable, but exceedingly restless, and unable to concentrate her attention.

She was treated from May 17th to 21st inclusive, receiving six hours' exposure each day with flat applicators containing 200 mgr. screened with 2 mm. of lead, placed over and around the thyroid gland.

Slow, but steady and distinct improvement resulted from the treatment, and in January, 1916, the patient's medical man wrote saying that all the nervous symptoms had gone, the thyroid was no longer enlarged, and the proptosis was scarcely appreciable. The pulse-rate was normal, the hyperidrosis and extreme restlessness had disappeared, the patient had gained fourteen pounds in weight, and was living a perfectly happy and useful life.

No further treatment has been required.

ARTHRITIS DEFORMANS. Increasing experience in the treatment of this disease serves to confirm the opinion expressed in previous reports that the daily administration of 250 cc. of radium emanation solution of a strength of not less than 1 millicurie per litre will often produce a very remarkable improvement in the condition of patients suffering from this intractable and distressing malady. Persons vary greatly in their degree of response to the treatment, but most good is to be anticipated when the patient is under forty years of age, the disease of but short duration and infective in origin, and the changes periarticular in type and multiarticular in distribution.

The monarticular type with a definite traumatic history is but rarely benefited, and little or no improvement can be expected when cartilaginous or osseous changes are predominant, as radium emanation is powerless to bring about the absorption of osteophytic growths or the loosening of bony ankylosis. In susceptible subjects radium emanation solution has a most beneficial effect upon the general health; the muscular tone improves, the haemoglobin index rises, pain disappears, and sleep becomes sound and undisturbed.

Digestive disturbances of slight degree are also often abolished, and the action of the bowels becomes freer and more regular. Diuresis is almost invariably noted.

Cases with a definite gouty history sometimes experience an acute exacerbation of all their symptoms within the first week or ten days of their treatment, but this disturbance is quite transient, and is usually followed by a distinct change for the better.

I desire to express my great indebtedness for much valuable assistance in the compilation of this report to my colleague, Dr. J. E. A. Lynham, who, during the past two years has been solely responsible for the conduct of the night clinic, and for the treatment of all the patients attending it.

The cases and opinions herin recorded are the result of our joint observations.

REPORT OF THE CHEMICO-PHYSICAL LABORATORY.

By W. L. S. Alton, F. I. C., Director.

On account of the depletion of the laboratory staff by military exigencies, very little new work has been attempted; the preparation of radium emanation applicators and radium emanation solution having entirely occupied the time of the members remaining.

Emanation Applicators.

The output of these applicators continues to be maintained, and a table is given for the numbers made in 1915 and 1916.

	1915	1916
No. of emanation tubes and applicators prepared	507	593
Initial activity in terms of Radium Bromide	39.8 grammes.	42.42 grammes

The average strength of each applicator is thus equal to about 75 mgrs. of radium bromide, and the strongest tube made during the period was one equal in activity to 263 mgrs.

These tubes and applicators have been used by medical men and by hospitals for patients unable to bear the strain of traveling to and from the Institute, and many of them have been supplied gratuitously for the treatment of necessitous patients. As the methods of manipulation improve, the tendency is to decrease the size of the tubes made for insertion into growths. It has been found possible to charge with emanation, capillary tubes which fit into platinum needles of a total length of 14 mm., diameter 1.7 mm., and thickness of wall 0.3 mm.

The glass capillary tube that fits such a screen has a capacity of about 3.5 cubic millimetres, and can be made to contain emanation equal in activity to 50 mgrs, of radium bromide.

It is convenient to make this tube much longer than the screen it is intended for, shortening the tube by cooling one end in liquid air, and when the internal pressure is lowered, reducing the length of the tube by means of a mouth blow-pipe.

Radio-Active Water.

	1915.	1916.
No. of bottles of radium emanation solution distributed	17,492	10,836
Total output in litres	4,393	3,030

The initial strength of the solution has been maintained at between 1.5 and 2.0 millicuries of emanation per litre, which far exceeds that of any of the radio-active waters derived from natural sources.

Radium Applicators and Measurements.

	1915.	1916
No. of radium applicators prepared	12	6

These applicators were prepared for medical men, and for hospitals in various parts of the world, but as is obvious, this type of work has been much restricted by the war. In addition, most of the radium applicators in use in the Institute have been either repaired or remade during the period 1915-1916.

	1915.	1916.
No. of measurements of radio-activity	12	4

A physical laboratory has been installed and equipped in the new building, and is in use daily for the purpose of standardising the emanation apparatus constructed.

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